

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings of claims in the application:

Listing of Claims:

1. (Currently amended) A recombinant thermostable DNA polymerase which is characterized in that

a) said thermostable DNA polymerase comprises:

i) the amino acid sequence LeuSerXaaXaaLeuXaaXaaProXaaXaaGlu (SEQ ID NO: 1), whereby "Xaa" at positions 3, 9, and 10 of said sequence are any amino acid residue, "Xaa" at position 6 is Ala or Ser and "Xaa" at position 7 of said sequence is Ile and "Xaa" at position 4 is not Glu, and

ii) said thermostable DNA polymerase has a level of discrimination against incorporation of nucleotides labeled with fluorescein family dyes which is reduced in comparison to a polymerase whose sequence is identical to that of said thermostable DNA polymerase except that "Xaa" at position 4 is Glu; and,

b) wherein said polymerase is selected from a ~~Thermus species~~ the group consisting of: *Thermus thermophilus*, *Thermus specie Z05*, *Thermus Specie sps17*, *Thermus caldophilus*, *Thermus filiformis*, *Thermus oshimai*, *Thermus silvanus*, *Thermus chliarophilus*, *Thermus scotoductus*, *Thermus ruber*, *Thermus brockianus*, *Thermotoga maritima*, *Thermotoga neapolitana*, *Thermosipho africanus*, *Bacillus caldotenax*, and *Bacillus stearothermophilus* ~~other than Thermus aquaticus~~.

2. (Previously presented) The recombinant thermostable DNA polymerase of claim 1 wherein said DNA polymerase comprises the amino acid sequence LeuSerXaaXaaLeuXaaXaaProXaaXaaGlu (SEQ ID NO: 1), whereby "Xaa" at positions 3, 9, and 10 of said sequence are any amino acid residue, "Xaa" at position 6 is Ala or Ser and "Xaa" at position 7 of said sequence is Ile and "Xaa" at position 4 is not Glu; and

said nucleotides are dideoxynucleotides and said level of discrimination is at least 3-fold lower than that of said polymerase whose sequence is identical to that of said thermostable DNA polymerase except that "Xaa" at position 4 is Glu.

3. (Original) The recombinant thermostable DNA polymerase of claim 2 wherein said level of discrimination is measured by determining the concentration of a dideoxynucleotide labeled with a fluorescein dye that is required for 50% inhibition of DNA synthesis.

4-5. (Canceled)

6. (Previously presented) The recombinant thermostable DNA polymerase of claim 1 which is characterized in that

a) said thermostable DNA polymerase comprises the amino acid sequence LeuSerXaaXaaLeuXaaIleProTyrGluGlu (SEQ ID NO: 2), whereby "Xaa" at position 3 is Gln or Gly, "Xaa" at position 4 is any amino acid except Glu, and "Xaa" at position 6 is Ser or Ala.

7. (Previously presented) The recombinant thermostable DNA polymerase of claim 1 which is characterized in that

a) said thermostable DNA polymerase comprises the amino acid sequence LeuSerGlnXaaLeuAlaIleProTyrGluGlu (SEQ ID NO:3), whereby "Xaa" at position 4 is any amino acid except Glu.

8. (Previously presented) The recombinant thermostable DNA polymerase of claim 7 wherein said "Xaa" at position 4 of the thermostable DNA polymerase is Lys.

9-10. (Canceled)

11. (Currently amended) A nucleic acid sequence encoding a recombinant thermostable DNA polymerase which is characterized in that

a) said thermostable DNA polymerase comprises:

i) the amino acid sequence LeuSerXaaXaaLeuXaaXaaProXaaXaaGlu (SEQ ID NO: 1), whereby "Xaa" at positions 3, 9, and 10 of said sequence are any amino acid residue, "Xaa" at position 6 is Ala or Ser and "Xaa" at position 7 of said sequence is Ile and "Xaa" at position 4 is not Glu, and

ii) said thermostable DNA polymerase has a level of discrimination against incorporation of nucleotides labeled with fluorescein family dyes which is reduced in comparison to a polymerase whose sequence is identical to that of said thermostable DNA polymerase except that "Xaa" at position 4 is Glu; and,

b) wherein said polymerase is selected from ~~a *Thermus* species~~ the group consisting of: *Thermus thermophilus*, *Thermus specie* Z05, *Thermus Specie sps17*, *Thermus caldophilus*, *Thermus filiformis*, *Thermus oshimai*, *Thermus silvanus*, *Thermus chliarophilus*, *Thermus scotoductus*, *Thermus ruber*, *Thermus brockianus*, *Thermotoga maritima*, *Thermotoga neapolitana*, *Thermosipho africanus*, *Bacillus caldotenax*, and *Bacillus stearothermophilus* ~~other than *Thermus aquaticus*.~~

12. (Previously presented) The nucleic acid sequence of claim 11 wherein said nucleotides are dideoxynucleotides and said level of discrimination is at least 3-fold lower than that of said polymerase whose sequence is identical to that of said thermostable DNA polymerase except that "Xaa" at position 4 is Glu.

13. (Original) The nucleic acid sequence of claim 12 wherein said level of discrimination is measured by determining the concentration of a dideoxynucleotide labeled with a fluorescein dye that is required for 50% inhibition of DNA synthesis.

14-15. (Canceled)

16. (Previously presented) The nucleic acid sequence of claim 12 which is characterized in that

a) said thermostable DNA polymerase comprises the amino acid sequence LeuSerXaaXaaLeuXaaIleProTyrGluGlu (SEQ ID NO: 2), whereby "Xaa" at position 3 is Gln or Gly, "Xaa" at position 4 is any amino acid except Glu, and "Xaa" at position 6 is Ser or Ala.

17. (Previously presented) The nucleic acid sequence of claim 12 which is characterized in that

a) said thermostable DNA polymerase comprises the amino acid sequence LeuSerGlnXaaLeuAlaIleProTyrGluGlu (SEQ ID NO:3), whereby "Xaa" at position 4 is any amino acid except Glu.

18. (Previously presented) The nucleic acid sequence of claim 17 wherein the "Xaa" at position 4 of the thermostable DNA polymerase is Lys.

19-20. (Canceled)

21. (Currently amended) A method of DNA sequencing which comprises:

a) providing a thermostable DNA polymerase characterized in that

i) said thermostable DNA polymerase comprises:

1) the amino acid sequence

LeuSerXaaXaaLeuXaaXaaProXaaXaaGlu (SEQ ID NO: 1), whereby "Xaa" at positions 3, 9, and 10 of said sequence are any amino acid residue, "Xaa" at position 4 is not Glu, "Xaa" at position 6 is Ala or Ser and "Xaa" at position 7 of said sequence is Ile, and

2) said thermostable DNA polymerase has a level of discrimination against incorporation of nucleotides labeled with fluorescein family dyes which is reduced in comparison to a polymerase whose sequence is identical to that of said thermostable DNA polymerase except that "Xaa" at position 4 is Glu; and

ii) wherein said polymerase is selected from a ~~Thermus~~ species the group consisting of: *Thermus thermophilus*, *Thermus specie Z05*, *Thermus Specie sps17*, *Thermus caldophilus*, *Thermus filiformis*, *Thermus oshimai*, *Thermus silvanus*, *Thermus chliarophilus*, *Thermus scotoductus*, *Thermus ruber*, *Thermus brockianus*, *Thermotoga*

maritima, Thermotoga neapolitana, Thermosipho africanus, Bacillus caldotenax, and Bacillus stearothermophilus ~~other than Thermus aquaticus~~;

b) providing a dye-terminator labeled with a negatively charged fluorescent dye;
and

c) performing a dye-terminator sequencing reaction.

22. (Previously presented) The method of claim 21 wherein said nucleotides are dideoxynucleotides and said level of discrimination is measured by determining the ratio of the concentration of a dideoxynucleotide labeled with a fluorescein dye required for 50% inhibition of DNA synthesis versus the concentration of an unlabeled dideoxynucleotide required for 50% inhibition.

23. (Original) The method of claim 22 wherein said ratio is 4 or less.

24-25. (Canceled)

26. (Previously presented) The method of claim 21 wherein said amino acid sequence comprises LeuSerGlnXaaLeuAlaIleProTyrGluGlu (SEQ ID NO:3), whereby "Xaa" at position 4 is any amino acid except Glu.

27. (Previously presented) The method of claim 26 wherein the "Xaa" at position 4 of the thermostable DNA polymerase is Lys.

28-30. (Canceled)

31. (Currently amended) A method of producing labeled DNA which comprises:

a) providing a thermostable DNA polymerase characterized in that

i) said thermostable DNA polymerase comprises:

1) the amino acid sequence

LeuSerXaaXaaLeuXaaXaaProXaaXaaGlu (SEQ ID NO: 1), whereby "Xaa" at positions 3, 9, and

10 of said sequence are any amino acid residue, "Xaa" at position 6 is Ala or Ser and "Xaa" at position 7 of said sequence is Ile and "Xaa" at position 4 is any amino acid except Glu, and

2) said thermostable DNA polymerase has a level of discrimination against incorporation of nucleotides labeled with fluorescein family dyes which is reduced in comparison to a polymerase whose sequence is identical to that of said thermostable DNA polymerase except that "Xaa" at position 4 is Glu; and

ii) wherein said polymerase is selected from a ~~Thermus~~ species the group consisting of: *Thermus thermophilus*, *Thermus specie Z05*, *Thermus Specie sps17*, *Thermus caldophilus*, *Thermus filiformis*, *Thermus oshimai*, *Thermus silvanus*, *Thermus chliarophilus*, *Thermus scotoductus*, *Thermus ruber*, *Thermus brockianus*, *Thermotoga maritima*, *Thermotoga neapolitana*, *Thermosipho africanus*, *Bacillus caldotenax*, and *Bacillus stearothermophilus* ~~other than *Thermus aquaticus*~~;

b) providing a nucleotide labeled with a fluorescein family dye; and

c) performing a DNA synthesis reaction.

32. (Currently amended) A method of producing labeled primer extension products which comprises:

a) providing a thermostable DNA polymerase characterized in that

i) said thermostable DNA polymerase comprises:

1) the amino acid sequence

LeuSerXaaXaaLeuXaaXaaProXaaXaaGlu (SEQ ID NO: 1), whereby "Xaa" at positions 3, 9, and 10 of said sequence are any amino acid residue, "Xaa" at position 6 is Ala or Ser and "Xaa" at position 7 of said sequence is Ile and "Xaa" at position 4 is any amino acid except Glu, and

2) said thermostable DNA polymerase has a level of discrimination against incorporation of nucleotides labeled with fluorescein family dyes which is reduced in comparison to a polymerase whose sequence is identical to that of said thermostable DNA polymerase except that "Xaa" at position 4 is Glu;

3) said polymerase also comprises the second amino acid sequence SerGlnIleXaaLeuArg(Val/Ile) (SEQ ID NO: 18) where "X" is any amino acid except Glu, and

4) said polymerase has a level of discrimination against incorporation of ribonucleotides labeled with fluorescein family dyes which is reduced in comparison to the polymerase whose sequence is identical to that of said thermostable DNA polymerase except that "Xaa" at position 4 is Glu; and

ii) wherein said polymerase is selected from a ~~Thermus species~~ the group consisting of: *Thermus thermophilus*, *Thermus specie Z05*, *Thermus Specie sps17*, *Thermus caldophilus*, *Thermus filiformis*, *Thermus oshimai*, *Thermus silvanus*, *Thermus chliarophilus*, *Thermus scotoductus*, *Thermus ruber*, *Thermus brockianus*, *Thermotoga maritima*, *Thermotoga neapolitana*, *Thermosipho africanus*, *Bacillus caldotenax*, and *Bacillus stearothermophilus* ~~other than *Thermus aquaticus*~~;

b) providing a ribonucleotide labeled with a fluorescein family dye; and

c) performing a primer extension reaction.

33. (Currently amended) A kit for DNA sequencing which comprises:

a) a recombinant thermostable DNA polymerase characterized in that

i) said thermostable DNA polymerase comprises:

1) the amino acid sequence

LeuSerXaaXaaLeuXaaXaaProXaaXaaGlu (SEQ ID NO: 1), whereby "Xaa" at positions 3, 9, and 10 of said sequence are any amino acid residue, "Xaa" as position 4 can be any amino acid except Glu, "Xaa" at position 6 is Ala or Ser and "Xaa" at position 7 of said sequence is Ile, and

2) said thermostable DNA polymerase has a level of discrimination against incorporation of nucleotides labeled with fluorescein family dyes which is reduced in comparison to a polymerase whose sequence is identical to that of said thermostable DNA polymerase except that "Xaa" at position 4 is Glu; and

ii) wherein said polymerase is selected from a ~~Thermus species~~ the group consisting of: *Thermus thermophilus*, *Thermus specie Z05*, *Thermus Specie sps17*, *Thermus caldophilus*, *Thermus filiformis*, *Thermus oshimai*, *Thermus silvanus*, *Thermus chliarophilus*, *Thermus scotoductus*, *Thermus ruber*, *Thermus brockianus*, *Thermotoga*

maritima, Thermotoga neapolitana, Thermosipho africanus, Bacillus caldotenax, and Bacillus stearothermophilus ~~other than Thermus aquaticus~~;

b) a terminator labeled with negatively-charged fluorescent dye.

34. (Original) The kit of claim 33 wherein said reduced level of discrimination is measured by determining the ratio of the concentration of ddNTP labeled with a fluorescein family dye required for 50% inhibition of DNA synthesis compared to that for an unlabeled ddNTP and said ratio is 4 or less.

35. (Original) The kit of claim 34 wherein said amino acid sequence comprises: LeuSerGlnXaaLeuAlaIleProTyrGluGlu (SEQ ID NO:3), whereby "Xaa" at position 4 is any amino acid except Glu.

36. (Previously presented) The kit of claim 35 wherein the "Xaa" at position 4 of the thermostable DNA polymerase is Lys.

37-38. (Canceled)

39. (Currently amended) A kit for a DNA extension reaction, the kit comprising:

a) a recombinant thermostable DNA polymerase characterized in that

i) said thermostable DNA polymerase comprises:

1) the amino acid sequence

LeuSerXaaXaaLeuXaaXaaProXaaXaaGlu (SEQ ID NO: 1), whereby "Xaa" at positions 3, 9, and 10 of said sequence are any amino acid residue, "Xaa" as position 4 can be any amino acid except Glu, "Xaa" at position 6 is Ala or Ser and "Xaa" at position 7 of said sequence is Ile, and

2) said thermostable DNA polymerase has a level of discrimination against incorporation of nucleotides labeled with fluorescein family dyes which is reduced in comparison to a polymerase whose sequence is identical to that of said thermostable DNA polymerase except that "Xaa" at position 4 is Glu; and

ii) wherein said polymerase is selected from a ~~Thermus species~~ the group consisting of: *Thermus thermophilus*, *Thermus specie Z05*, *Thermus Specie sps17*, *Thermus caldophilus*, *Thermus filiformis*, *Thermus oshimai*, *Thermus silvanus*, *Thermus chliarophilus*, *Thermus scotoductus*, *Thermus ruber*, *Thermus brockianus*, *Thermotoga maritima*, *Thermotoga neapolitana*, *Thermosipho africanus*, *Bacillus caldotenax*, and *Bacillus stearothermophilus* ~~other than *Thermus aquaticus*~~.

40. (Previously presented) The kit of claim 39 wherein said thermostable DNA polymerase comprises the amino acid sequence LeuSerXaaXaaLeuXaaXaaProXaaXaaGlu (SEQ ID NO: 1), whereby "Xaa" at positions 3, 9, and 10 of said sequence are any amino acid residue, "Xaa" as position 4 can be any amino acid except Glu, "Xaa" at position 6 is Ala or Ser and "Xaa" at position 7 of said sequence is Ile and said level of discrimination is at least 5-fold lower than that of a thermostable DNA polymerase whose sequence is identical to said thermostable DNA polymerase except that position 4 is Glu.

41. (Previously presented) The kit of claim 40 wherein said recombinant thermostable DNA polymerase is characterized in that the thermostable DNA polymerase comprises the amino acid sequence LeuSerGlnXaaLeuAlaIleProTyrGluGlu (SEQ ID NO:3), whereby "Xaa" at position 4 is any amino acid except Glu.

42. (Previously presented) The kit of claim 41 wherein the "Xaa" at position 4 of the thermostable DNA polymerase is Lys.

43-44. (Canceled)

45. (Currently amended) A kit for producing labeled DNA which comprises:
a) a recombinant thermostable DNA polymerase characterized in that

i) said thermostable DNA polymerase comprises:

1) the amino acid sequence

LeuSerXaaXaaLeuXaaXaaProXaaXaaGlu (SEQ ID NO: 1), whereby "Xaa" at positions 3, 9, and

10 of said sequence are any amino acid residue, "Xaa" at position 6 is Ala or Ser and "Xaa" at position 7 of said sequence is Ile and "Xaa" at position 4 is any amino acid except Glu, and

2) said thermostable DNA polymerase has a level of discrimination against incorporation of nucleotides labeled with fluorescein family dyes which is reduced in comparison to a polymerase whose sequence is identical to that of said thermostable DNA polymerase except that "Xaa" at position 4 is Glu; and

ii) wherein said polymerase is selected from a ~~Thermus species~~ the group consisting of: *Thermus thermophilus*, *Thermus specie Z05*, *Thermus Specie sps17*, *Thermus caldophilus*, *Thermus filiformis*, *Thermus oshimai*, *Thermus silvanus*, *Thermus chliarophilus*, *Thermus scotoductus*, *Thermus ruber*, *Thermus brockianus*, *Thermotoga maritima*, *Thermotoga neapolitana*, *Thermosipho africanus*, *Bacillus caldotenax*, and *Bacillus stearothermophilus* ~~other than *Thermus aquaticus*~~; and

b) a nucleotide labeled with a negatively-charged fluorescent dye.

46. (Previously presented) The kit of claim 45 wherein said amino acid sequence comprises LeuSerGlnXaaLeuAlaIleProTyrGluGlu (SEQ ID NO: 3), whereby "Xaa" at position 4 is any amino acid except Glu.

47. (Previously presented) The kit of claim 45 wherein the "Xaa" at position 4 of the thermostable DNA polymerase is Lys.

48-49. (Canceled)

50. (Currently amended) A kit for producing labeled primer extension products which comprises:

a) a recombinant thermostable DNA polymerase which is characterized in that

i) said thermostable DNA polymerase comprises:

1) the amino acid sequence

LeuSerXaaXaaLeuXaaXaaProXaaXaaGlu (SEQ ID NO: 1), whereby "Xaa" at positions 3, 9, and

10 of said sequence are any amino acid residue, "Xaa" at position 6 is Ala or Ser and "Xaa" at position 7 of said sequence is Ile and "Xaa" at position 4 is any amino acid except Glu, and

2) said thermostable DNA polymerase has a level of discrimination against incorporation of nucleotides labeled with fluorescein family dyes which is reduced in comparison to a polymerase whose sequence is identical to that of said thermostable DNA polymerase except that "Xaa" at position 4 is Glu;

3) the thermostable DNA polymerase also comprises the second amino acid sequence SerGlnIleXaaLeuArg(Val/Ile) (SEQ ID No: 18) where "Xaa" is any amino acid except Glu;

4) the thermostable DNA polymerase has a level of discrimination against incorporation of ribonucleotides labeled with fluorescein family dyes which is reduced in comparison to the thermostable DNA polymerase; and

ii) wherein said polymerase is selected from a ~~Thermus species~~ the group consisting of: *Thermus thermophilus*, *Thermus specie Z05*, *Thermus Specie sps17*, *Thermus caldophilus*, *Thermus filiformis*, *Thermus oshimai*, *Thermus silvanus*, *Thermus chliarophilus*, *Thermus scotoductus*, *Thermus ruber*, *Thermus brockianus*, *Thermotoga maritima*, *Thermotoga neapolitana*, *Thermosipho africanus*, *Bacillus caldotenax*, and *Bacillus stearothermophilus* ~~other than *Thermus aquatious*~~; and

b) a ribonucleotide labeled with a fluorescein family dye.

51. (Previously presented) The kit of claim 50 wherein said amino acid sequence comprises LeuSerGlnXaaLeuAlaIleProTyrGluGlu (SEQ ID NO:3), whereby "Xaa" at position 4 is any amino acid except Glu.

52. (Previously presented) The kit of claim 51 wherein the "Xaa" at position 4 of the thermostable DNA polymerase is Lys.

53-54. (Canceled).

55. (New) The recombinant thermostable DNA polymerase of claim 1, wherein the polymerase is *Thermus thermophilus*.

56. (New) The recombinant thermostable DNA polymerase of claim 1, wherein the polymerase is *Thermus specie Z05*.

57. (New) The recombinant thermostable DNA polymerase of claim 1, wherein the polymerase is *Thermotoga maritima*.

58. (New) The nucleic acid sequence of claim 11, wherein the thermostable DNA polymerase is *Thermus thermophilus*.

59. (New) The nucleic acid sequence of claim 11, wherein the thermostable DNA polymerase is *Thermus specie Z05*.

60. (New) The nucleic acid sequence of claim 11, wherein the thermostable DNA polymerase is *Thermotoga maritima*.

61. (New) The method of claim 21, wherein the thermostable DNA polymerase is *Thermus thermophilus*.

62. (New) The method of claim 21, wherein the thermostable DNA polymerase is *Thermus specie Z05*.

63. (New) The method of claim 21, wherein the thermostable DNA polymerase is *Thermotoga maritima*.

64. (New) The method of claim 31, wherein the thermostable DNA polymerase is *Thermus thermophilus*.

65. (New) The method of claim 31, wherein the thermostable DNA polymerase is *Thermus specie Z05*.

66. (New) The method of claim 31, wherein the thermostable DNA polymerase is *Thermotoga maritima*.

67. (New) The method of claim 32, wherein the thermostable DNA polymerase is *Thermus thermophilus*.

68. (New) The method of claim 32, wherein the thermostable DNA polymerase is *Thermus specie Z05*.

69. (New) The method of claim 32, wherein the thermostable DNA polymerase is *Thermotoga maritima*.

70. (New) The kit of claim 33, wherein the thermostable DNA polymerase is *Thermus thermophilus*.

71. (New) The kit of claim 33, wherein the thermostable DNA polymerase is *Thermus specie Z05*.

72. (New) The kit of claim 33, wherein the thermostable DNA polymerase is *Thermotoga maritima*.

73. (New) The kit of claim 39, wherein the thermostable DNA polymerase is *Thermus thermophilus*.

74. (New) The kit of claim 39, wherein the thermostable DNA polymerase is *Thermus specie Z05*.

75. (New) The kit of claim 39, wherein the thermostable DNA polymerase is *Thermotoga maritima*.

76. (New) The kit of claim 45, wherein the thermostable DNA polymerase is *Thermus thermophilus*.

77. (New) The kit of claim 45, wherein the thermostable DNA polymerase is *Thermus specie Z05*.

78. (New) The kit of claim 45, wherein the thermostable DNA polymerase is *Thermotoga maritima*.

79. (New) The kit of claim 50, wherein the thermostable DNA polymerase is *Thermus thermophilus*.

80. (New) The kit of claim 50, wherein the thermostable DNA polymerase is *Thermus specie Z05*.

81. (New) The kit of claim 50, wherein the thermostable DNA polymerase is *Thermotoga maritima*.